

AMENDMENTS TO THE CLAIMS:

The listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF THE CLAIMS

1. (Currently Amended) A system for providing patterned illumination fields within an automated visual inspection system, the system comprising:
 - a patterned illuminator comprising light emitting diodes (LEDs) and at least one masking or blocking element configured to provide spatially-adjacent regions of uniform, diffuse lighting and lighting voids to produce engineered illumination fields on a highly specular three-dimensional part under inspection;
 - a receiver aperture positioned to receive light generated of a reflected image field including dark field regions corresponding to the lighting voids generated by the patterned illuminator, wherein the dark field regions illuminate a specular artifact on which has scattered or reflected off the part under inspection; and
 - a transport mechanism used to automatically convey and position highly specular, three-dimensional parts within the engineered illumination fields generated by the patterned illuminator.
2. (Original) The system as set forth in claim 1 wherein the patterned illuminator comprises a series of annular regions alternating between diffuse, uniform illumination and lighting voids.
3. (Previously presented) The system as set forth in claim 2 wherein the patterned illuminator comprises translucent diffusers having a light blocking annular pattern superimposed on surfaces thereof.
4. (Previously presented) The system as set forth in claim 2 wherein the patterned illuminator comprises diffuse reflecting surfaces having a light absorbing annular pattern superimposed on surfaces thereof.
5. (Canceled)

6. (Canceled)

7. (Previously Presented) The system as set forth in claim 3 wherein the LEDs are operated in a pulsed-mode to support stop action imaging of objects under inspection.

8. (Canceled)

9. (Previously Presented) The system as set forth in claim 4 wherein the LEDS are operated in a pulsed-mode to support stop action imaging of objects under inspection.

10. (Canceled)

11. (Currently Amended) The system as set forth in claim 1 wherein the LEDs are operated in a pulsed mode to support stop action imaging of objects under inspection.

12. (Currently Amended) The system as set forth in claim 1 wherein the receiver aperture contains a camera capable of generating a two-dimensional image in electronic format of the object under test part under inspection as it appears illuminated using the patterned illuminator.

13. (Previously Presented) The system as set forth in claim 12 wherein the receiver aperture additionally contains a processor means to autonomously process electronic image information into a status summary report indicative of the quality or status of the part under inspection.

14. (Currently Amended) A method of illuminating a part under inspection within an automated visual inspection system, the method comprising steps of:

positioning a highly specular, three-dimensional part under inspection using a transport mechanism at a selected location relative to a patterned illuminator comprising light emitting diodes (LEDs) and at least one masking or blocking element wherein illumination fields of the illuminator are selectively activated in an alternating on/off manner to produce an engineered illumination pattern;

illuminating the part under inspection using the engineered illumination pattern produced by the patterned illuminator; and

analyzing light of a reflected image field including dark field regions corresponding to the lighting voids generated by the patterned illuminator, wherein the dark field regions illuminate a specular artifact on that has subsequently reflected or scattered off the part under inspection for the purpose of deducing quality status information related to the part.

15. (Previously presented) The method as set forth in claim 14 comprising additional steps of:

positioning the part under inspection using the transport mechanism at a second location wherein the illumination fields of a second illuminator are selectively activated in an alternating on/off manner to produce an engineered illumination pattern such that an inverse engineered illumination pattern is enacted upon the surfaces of the part;

illuminating the part under inspection using the inverse engineered illumination pattern produced by the second illuminator; and

analyzing the light generated by the second illuminator that has subsequently reflected or scattered off the part under inspection for the purpose of deducing quality status information related to the part.

16. (Currently Amended) A system for providing patterned illumination fields within an automated visual inspection system, the system comprising:

a patterned illuminator comprising light emitting diodes (LEDs) configured to provide spatially-adjacent regions of uniform, diffuse lighting and lighting voids to produce engineered illumination fields on a highly specular, three-dimensional part, wherein the patterned illuminator comprises a series of discrete ring lights of various dimensions positioned to create the alternating pattern of illumination;

a receiver aperture positioned to receive light of a reflected image field including dark field regions corresponding to the lighting voids generated by the patterned illuminator, wherein the dark field regions illuminate a specular artifact on which has scattered or reflected off the highly specular, three-dimensional part under inspection; and

a transport mechanism used to automatically convey and position highly specular, three-dimensional parts under inspection within the engineered illumination fields generated by the patterned illuminator.

17. (Currently Amended) A method of illuminating a part under inspection within an automated visual inspection system, the method comprising steps of:

positioning a highly specular, three-dimensional part under inspection using a transport mechanism at a selected location relative to a patterned illuminator comprising light emitting diodes (LEDs) wherein illumination fields of the illuminator are selectively activated in an alternating on/off manner to produce an engineered illumination pattern wherein the patterned illuminator comprises a series of discrete ring lights of various dimensions positioned to create an alternating pattern of illumination;

illuminating the part under inspection using the engineered illumination pattern produced by the patterned illuminator; and

analyzing light of a reflected image field including dark field regions corresponding to the lighting voids generated by the patterned illuminator, wherein the dark field regions illuminate a specular artifact on that has subsequently reflected or scattered off the part under inspection for the purpose of deducing quality status information related to the part.

18. (Previously presented) The method as set forth in claim 17 comprising additional steps of:

positioning the part under inspection using the transport mechanism at a second location wherein the illumination fields of a second illuminator are selectively activated in an alternating on/off manner to produce an engineered illumination pattern such that an inverse engineered illumination pattern is enacted upon the surfaces of the part;

illuminating the part under inspection using the inverse engineered illumination pattern produced by the second illuminator; and

analyzing the light generated by the second illuminator that has subsequently reflected or scattered off the part under inspection for the purpose of deducing quality status information related to the part.